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## Business Process Reengineering on Customer Service and Procurement Units in Clinical Laboratory

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### Abstract

*Existing business processes in a clinical laboratory located in Bekasi are still run manually. It takes a lot of time to do more processes, especially in customer service and procurement units. These inefficient processes are analysed here. The utilisation of Information Technology (IT) supports the operations of a company and even improve the efficiency and effectiveness of a company. However, the use of information technology must be balanced with the readiness of existing resources to operate. Without supporting resources, especially human resources available, information technology is nothing. The Business Reengineering Process method used to comprehend the existing business process, determines processes to be reengineered, investigates alternative redesign, simulates the existing business processes and the proposed business processes, performs an analysis of simulation results, and seeks corporate opportunities using information technology. This Business Process Reengineering (BPR) research helped the clinical laboratory especially in customer service and procurement in improving the efficiency and effectiveness of existing processes that will ultimately reduce cost and time. Results showed that business processes increase with information technology utilisation and minimise the use of employees.*

**Keywords:** Business Process, Customer Service, Procurement, Reengineering

### 1. Introduction

Existing business processes in this clinical laboratory are less efficient since they run manually, requiring a more complex process resulting in inefficient business processes. It takes a lot of time to move from one activity to another activity. This ineffective situation resulted in the company's bad performance, and will result in increasing the cost of inefficient processes. Companies need efficiency and to make innovations to maintain their existing market share and to seize new market share along with other competitors. There are many factors that can make the economic climate in Indonesia become increasingly erratic; violence increases, as does the high political temperature, and others. Therefore, a company should be made efficient in all areas in order to reduce costs and improve competitiveness expenses. There are many reasons for sub-optimal business processes [1].

Developments in technology and communications have enabled the company to evaluate the mechanism of coordination of each unit. Currently, companies can no longer work traditionally. With the proper use of Information Technology (IT) like the application of computers and telecommunications equipment to store, retrieve, transmit and manipulate data, it can reduce the burden of unnecessary work so that the number of employees can be minimised [2]. In a business context, the Information Technology Association of America defined information technology as "the study, design, development, application, implementation, support or management of computer-based information systems" [3]. In addition, employees will ultimately not be burdened with excessive work.

The concept of Business Process Reengineering (BPR) as a strategy for creating change and improvement in organisations goes back to the 1980s when there was a concern that investments in information technology were not producing the results desired. Since the 1960s, business entities have poured billions of dollars into Information Technology (IT) investments and have seen only marginal improvements in business performance and

productivity [4],[5]. Many BPR advocates argue that it is extremely crucial to integrate BPR with a mechanism that allows for the continuous improvement of business processes in order to achieve dramatic gains. Continuous Quality Improvement (CQI), Total Quality Management (TQM), and ISO 9000 are a few of a wide range of continuous improvement techniques that are available for use with BPR [6]. Reengineering is the fundamental thinking and radical redesign of business processes to get a dramatic improvement in performance benchmarks such as cost, quality, service, and speed [7]. Lowenthal described reengineering as basic/ fundamental to rethink and redesign the process-performing operation and structure of an organisation, focusing on the core capabilities of organisations to get a dramatic improvement in organisational performance [8]. Al-Mashari and Zairi (2000) suggest that reengineering of business processes involves changes in people (behaviour and culture), processes and technology [9]. Reengineering efforts can by no means be exercised without a company-wide commitment to the goals. However, top management commitment is imperative for success [10]. Multi-source fusion B2C business process reengineering of the Petri net model is established and simulated. Through the associated matrix and accessibility analysis, the Petri net model simulated with CPNTools software meets the expected goals [11].

The author would like to assist this clinical laboratory in analysing their existing business processes and help reduce costs and improve competitiveness expenses. This article consists of a small portion of all macro issues existing in the company as well as in part of customer service and procurement.

## 2. Research Method

This research was conducted on the largest clinical laboratory network in Indonesia centered in the area of Kramat Raya. It has 110 branches in 96 cities. Many awards have been achieved which support the patients' confidence to have their health checked such as cholesterol, uric acid, blood sugar and medical check-ups, and others in many branches near their homes. This research was conducted on the Bekasi branch. Patients who come on average per day, reached 112 people, while the average monthly amount reached 2800 people.

This research method is based on Victor SL Tan and Davenport [12],[13]. A new process will produce better results than existing processes by merging two existing theories about the stages in performing reengineering. The stages are used in this research are:

1. Understanding the existing business process: documents related to customer service and procurement in the clinical laboratory particularly managed through a survey and interviews.
2. Determining the processes to be reengineered: after identifying existing business processes then determining which process is needed to reengineer based on identified problems.
3. Investigating alternative redesign: proposed business processes can be achieved among others, to eliminate bureaucracy, eliminate activities with no added value, simplify processes, reduce processing time, eliminate errors in the process, standardisation and automation.
4. Simulating the existing business processes and the proposed business processes: the simulation for measuring business process reengineering is conducted on existing business processes and proposed business processes using iGrafx Process 2013 software to obtain information about the average length of time required to complete business processes (<http://www.igrafx.com/>).
5. Performing an analysis of simulation results: from comparison analysis between existing and proposed business processes can be determined whether the proposed business processes give better results than the existing one, how improvement is obtained from the proposed business processes compared with the existing business process using graphs.

Seeking opportunities in using information technology: seeking opportunities especially on issues focused in this research. The utilisation of information technology will allow employees to exchange information.

## 3. Analysis and Discussion

In this section is explained the analysis of research and at the same time, a comprehensive discussion is given.

### 3.1. General Description of Existing Business Processes

In better designing new business processes, it is necessary to analyse existing business processes. This step is very important because it determines which processes are inefficient, need to be repaired and which steps need to be added in order to achieve maximum results. The general description of customer service and procurement are registering patients and taking their blood samples to the phlebotomist.

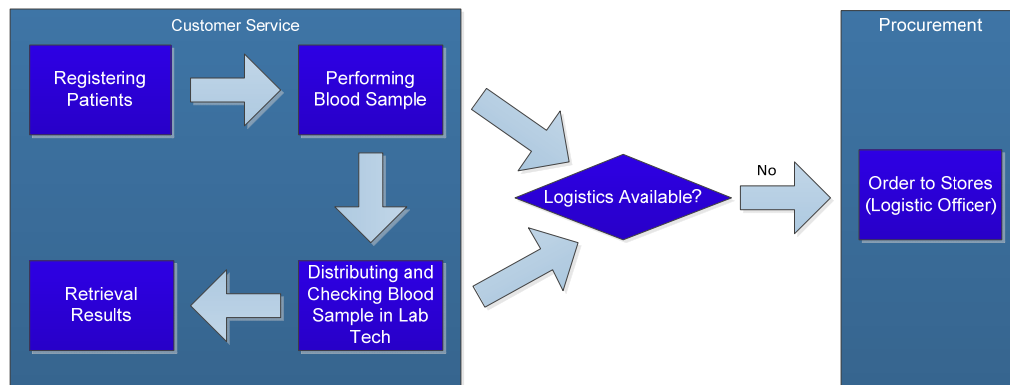


Figure 1. General Description of Existing Business Processes in Clinical Laboratory

The phlebotomist sends their blood to laboratory technicians. The results tests can be obtained by the patient in accordance with a predetermined time. If the logistics (tools, reagents, etc.) are not available from laboratory technicians and the phlebotomist officer, they must order them in store (logistics officer). The overview is a general description of existing business processes as in Figure 1.

### 3.2. Discussion of Existing Business Processes

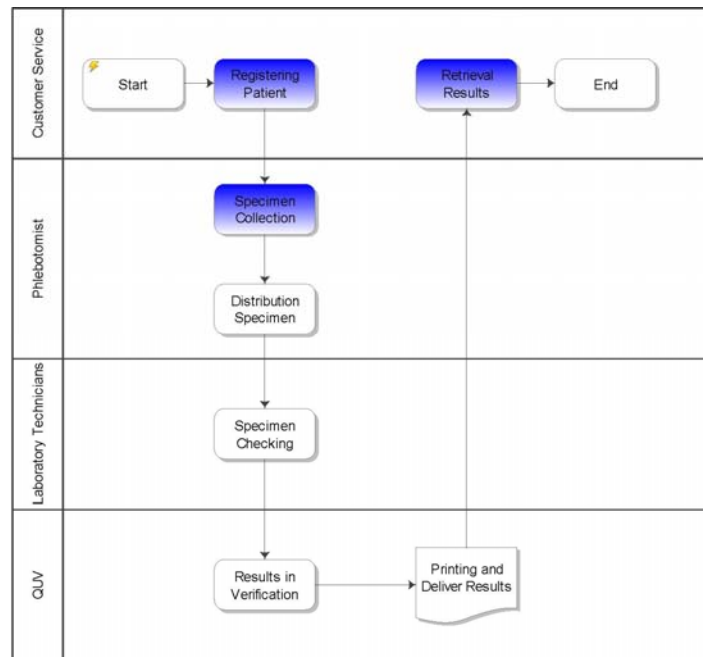
This section will explain existing business processes in customer service and procurement in the clinical laboratory. A more detailed explanation of existing business processes and analysis of identified problems will be discussed in the next subsection.

#### 3.2.1. Details of Existing Business Processes in Customer Service

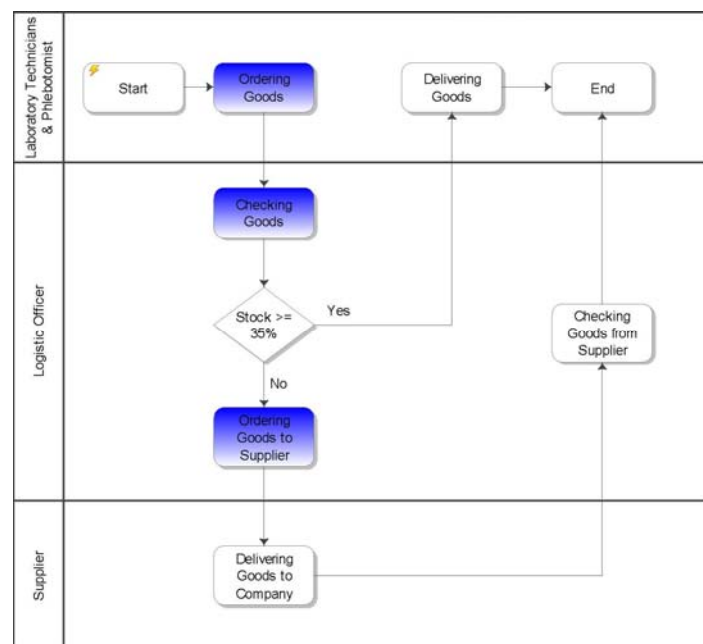
This section will explain in detail existing business processes in customer service. From Figure 2 it can be seen there is a different colour between the existing business processes. The "blue" colour means the process is a process to be reengineered.

Figure 2(a) is detailed explanation of each existing business process in customer service, such as:

1. Registering patients: in this process, the patient first take a queue number and waits to be called. He will be called by customer service to give information such as personal data and any desired examination the patient has. He will also be asked whether there is a referral from a doctor or partner companies of the clinical laboratory. This process takes a time of about eight minutes with three employees.
2. Specimen collection: this process is a process in which the patient's specimen is taken depending on the demand at early registration. This process takes quite a long time because sometimes there is a lack of cooperation between the patient and the phlebotomist in collecting the specimen. It usually occurs in children and the aged. This process takes a time of about 12 minutes with two employees.



(a) Customer Service Unit



(b) Procurement Unit

Figure 2. Existing Business Processes

3. Distribution specimen: specimens from the phlebotomist will be given to other units. Separated specimens will be checked in each unit by laboratory technicians. This process takes a time of about 10 minutes with one employee.
4. Specimen checking: specimens will be tested in each unit by laboratory technicians using accurate laboratory technologies in accordance with their role. After obtaining the results

from the appliance they are then sent to QUV (QUV itself is a term for people who verify the result test), to be verified. This process takes for about 60 minutes with four employees.

5. Results in verification: QUV verifies the results already obtained by each laboratory technician. Verify here means that the obtained results have standards and original marks officially by the clinical laboratory. This process takes a time of about 30 minutes with one employee.
6. Printing and delivering results: QUV prints results that have been previously verified and then delivers them to customer service to be taken by the patient. This process takes a time of about 15 minutes with one employee.
7. Retrieval Results: the patient takes the results of the previous inspection carried out according to the time scheduled at early registration. The patient returns again to take the results from the receptionist as in the previous registration and should still take a queue number. This process takes a time of about 10 minutes with three employees.

### 3.2.2. Details of Existing Business Processes in Procurement

This section will explain in detail existing business processes in procurement. Figure 2(b) shows there is also a different colour between the existing businesses process. The “blue” colour means a process to be reengineered.

Figure 2(b) explains each existing business process in procurement, as below:

1. Ordering goods from laboratory technicians and the phlebotomist: in this process, laboratory technicians and the phlebotomist fill out the order goods form once every four days or indeed, they would have no stock of goods in each unit. Each unit should fill in the form to QUV and later to the logistics officer. This process takes a time of about 15 minutes with one employee.
2. Checking of goods in store: as the receipt or form is accepted, then the logistics officer checks manually if there are still stock items in storage by visiting it directly. If stocks are still greater than or equal to 35% of the ordered goods as before, the process can be supplied as in process 4. If not, the logistics officer must order from the supplier as in process 3. This process takes a time of about 10 minutes with one employee.
3. Ordering goods from the supplier: from the previous process, if the stock is less than 35%, the logistics officer must order the goods from the suppliers with a copy by sending the order form via e-mail or fax. The logistic officer waits for a confirmation reply. If the order form has been received already, the logistics officer gives the original order form to the supplier. The supplier will charge the centre's logistics officer of the clinical laboratory located in Bandung. This process takes a time of about one hour or 60 minutes with one employee.
4. Delivering goods to laboratory technicians and the phlebotomist: after all supporting documents are ready, then goods are ready delivered to the laboratory technicians and the phlebotomist. Delivery of goods to laboratory technicians and the phlebotomist is usually directly performed on the same day when goods in store are available. This delivery takes about five minutes with one employee.
5. Delivering goods to the company: the same as in process 4, goods are ready to be sent to the clinical laboratory. The delivery of goods to the clinical laboratory will normally be directly performed on the same day when goods are available from the suppliers. This long delivery takes about two hours or 120 minutes if not exposed to traffic jams or other delays with one employee.
6. Checking goods from the supplier: the logistics officer is responsible for accepting goods ordered in accordance with an order form. In the current system, items come usually accompanied by a delivery note. This includes the delivery note number and item name as well as certain specifications, and the price of goods. Goods arrived will be matched with an order form shipped from the previous supplier. If not appropriate, the items will still be accepted, but the logistics officer will send a confirmation (sent using e-mail or fax) to the

supplier, as well as the correct order form, and then the item will be stocked in the company. This process takes a time of about 15 minutes with one employee.

### 3.2.3. Problems Analysis

Problems, especially in customer service and procurement process include:

1. Customer service: problems are the time spent collecting patients' specimens due to difficult factors to work together in doing so, accuracy of data when inputting patient data and long queue time making patients wait.
2. Procurement: problems are the delay times in delivering goods because of the order form, traffic jams, etc. The logistics officer checks available stock in stores which have no link in the order form from the laboratory technicians and the phlebotomist.

### 3.3. Draft Proposed Solution

After knowing the problems in the existing business process then several solutions are proposed. Table 1 and Table 2 describe the proposed solutions of each problem.

Table 1. Draft Proposed Solution of Customer Service

No	Sub Process	Problems	Solution
1	Registering patients	Patients data input makes patients have to wait sometime and must make a queue.	In application system of existing service can be added auto text during input patient data to add accuracy of patient data. It can reduce number of queues at early registration.
2	Specimen collection	Time in the patient's specimen collection.	Phlebotomist addition for collecting specimen.
3	Retrieval results	Patients should make a queue again to take the result.	In taking the results, patient does not need come again to pick it up. Patients need only provide an email at early registration. If the examination results are above standard by QUV unit, QUV will send an email contains that patient has to come back to see the results and consult with employee or doctor on duty at Clinical laboratory.

Table 2. Draft Proposed Solution of Procurement

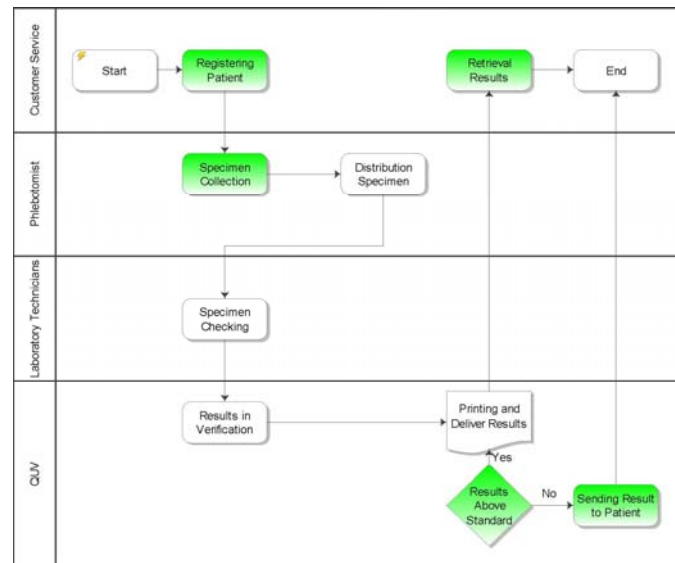
No	Sub Process	Problems	Solution
1	Ordering goods from Laboratory technicians and Phlebotomist	<ol style="list-style-type: none"> <li>1. Ordering good form from Laboratory technicians and Phlebotomist is paper based.</li> <li>2. It should be copied first to distribute to other units.</li> </ol>	<ol style="list-style-type: none"> <li>1. Creating an Enterprise Resource Planning (ERP) system.</li> <li>2. Laboratory technicians and Phlebotomist can entry an ordering good form into system so other units can check into the database if concerned in these documents.</li> </ol>
2	Checking of goods in store	It still performed manually to see the availability of goods in store.	Creating an Enterprise Resource Planning system (ERP) can instantly see the availability of goods in a system already in a previous entry so if stocks are not available, logistics officer can directly request to the supplier.
3	Ordering goods to Supplier	<ol style="list-style-type: none"> <li>1. Ordering good form to supplier is paper based.</li> <li>2. It should be copied first to distribute to other units.</li> </ol>	<ol style="list-style-type: none"> <li>1. Creating an Enterprise Resource Planning (ERP) system.</li> <li>2. Logistic officer can entry an ordering good form into system so other units can check into the database if concerned in these documents, including suppliers that will deliver goods companies need.</li> </ol>

### 3.4. Discussion of Proposed Business Process

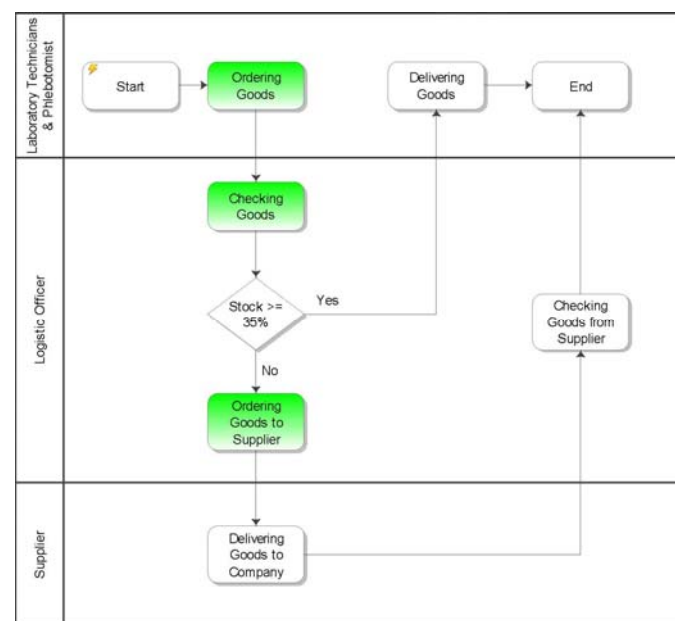
This section will explain the proposed business processes in customer service and procurement in the clinical laboratory. A more detailed explanation of existing business processes will be discussed next.

#### 3.4.1. Details of Proposed Business Processes in Customer Service

This section will explain in detail the proposed business processes in customer service. From Figure 3(a), it can be seen there is a different colour between the proposed business processes. The "green" colour is an addition or alteration process to existing business processes.



(a) Customer Service Unit



(b) Procurement Unit

Figure 3. Proposed Business Processes

Figure 3(a) shows there is an additional process such as sending results. A detailed explanation of each proposed business process in customer service is explained below:

1. Registering patients: the patient first takes a queue number and then waits to be called. Customer service will call and ask patients for personal data and any desired examination the patient has. He will also be asked if there is a referral from a doctor or partner companies of the clinical laboratory or not. This process takes a time of about eight minutes with two employees. This process has a shorter time because it gives an easy interface. The interface will serve with auto text input for patient data entry. In this proposed business process, he does not have to come again to collect the result. Therefore the company can reduce staff in this process.
2. Specimen collection: a process in which the patient's specimen is dependent on demand at early registration. This process takes quite a long time because sometimes there is a lack of cooperation between the patient and the phlebotomist at the time of the specimen collection. This usually occurs in children and the aged. This process takes a time of about seven minutes with three employees, having a shorter time due to the phlebotomist's addition.
3. Distribution specimen: specimens from the phlebotomist will be sent to other units. Separated specimens will be examined in each unit by the laboratory technicians. This process takes a time of about 10 minutes with one employee.
4. Specimen checking: specimens will be tested in each unit by laboratory technicians using accurate laboratory technologies in accordance with their role. After obtaining the results from the test they are then sent to QUV, to be verified. This process takes a time of about 60 minutes with four employees.
5. Results in verification: QUV verifies the results already obtained from each laboratory technician. Verify here means that the obtained results have standards and the official stamp of the clinical laboratory. This process takes a time of about 30 minutes with one employee.
6. Sending results: QUV sees the results that have been verified. If the results are far above the existing standard, QUV continues to process 7 and 8. If not, QUV sends the patient's results via SMS or e-mail. This process takes a time of about five minutes with one employee.
7. Printing and delivering results: QUV prints results that have been previously verified and then delivers them to customer service to be taken by the patient. This process takes a time of about 15 minutes with one employee.
8. Retrieval Results: the patient is getting the previous inspection results carried out according to results sent to the patient's mobile phone such as SMS and email. The content of the e-mail and SMS tells the results obtained whether it is far above the existing standard or not. Patients who have abnormal results will be asked to come again to have more recommendations or advice in the retrieval results unit. This process takes a time of about five minutes with one employee.

### 3.4.2. Details of Proposed Business Processes in Procurement

This section will explain in detail the proposed business processes in procurement. From Figure 3(b), it can be seen there is a different colour between the proposed business processes. Processes that are a "green" color are an addition or alteration process to existing business processes.

Specifically in the procurement process as shown in Figure 3(b), there are no additional processes or process name change, but there are three existing processes changed in the process mechanism with the utilisation of information technology so as to reduce the length of process time as detailed below. The changes will be in the process of ordering goods from the laboratory technicians and the phlebotomist, the checking of goods in store, and the ordering of goods from the supplier.

A more detailed explanation of each proposed business process in procurement, is explained below:



1. Ordering goods from laboratory technicians and the phlebotomist: laboratory technicians and the phlebotomist insert any demand for goods that are not available and needed in a short time into the Enterprise Resource Planning (ERP) system. This process takes a time of about five minutes with one employee.
2. Checking of goods in store: upon receipt of the previous process, the logistics officer checks if there are still stock items in storage by looking at the Enterprise Resource Planning (ERP) system. If stocks are still greater than or equal to 35% of the ordered goods as before, the process can be supplied as in process 4. If not, the logistics officer must order from the supplier as in process 3. This process takes a time of about five minutes with one employee.
3. Ordering goods from the supplier: from the previous process, if the stock is less than 35%, the logistics officer must order goods from the suppliers with the Enterprise Resource Planning (ERP) system connected to the supplier. Suppliers can directly accept a request sent by the logistics officer. Suppliers can provide notification (OK) whether the order has been received or it is not applicable. If the order goods form has been received already, the logistics officer gives the original order form to the supplier. The supplier will charge the centre's logistics officer of the clinical laboratory located in Bandung. This process takes a time of about 30 minutes with one employee.
4. Delivering goods to laboratory technicians and the phlebotomist: after all supporting documents are ready, then the goods are ready to be delivered to the laboratory technicians and the phlebotomist. The delivery of goods to laboratory technicians and the phlebotomist is usually directly performed on the same day when the goods in store are available. This delivery takes about five minutes with one employee.
5. Delivering goods to the company: the same as with process 4, goods are ready to be sent to the clinical laboratory. The delivery of goods to the clinical laboratory will normally be directly performed on the same day that goods are available from the suppliers. This long delivery takes about two hours or 120 minutes if not exposed to traffic jams or other delays with one employee.
6. Checking goods from the supplier: the logistics officer is responsible for accepting goods ordered in accordance with an order form. In the current system, items come usually accompanied by a delivery note. This includes the delivery note number and item name as well as certain specifications, and the price of goods. Goods arriving will be matched with an order form shipped from the previous supplier. If not appropriate, the items will be still accepted, but the logistics officer will send a confirmation (sent using e-mail or fax) to the supplier, as well as the correct order form, and then the item will be stocked in the company. This process takes a time of about 15 minutes with one employee.

### 3.5. Comparison of Existing Business Processes with Proposed Business Process

Simulation results are performed to existing and proposed business processes using an input for "Per Use Cost" in iGrafx Process 2013. The variable data value that should be input are the worker costs, number of employees, and length of time. We use U.S.\$100 cost for the workers as a simulation. The simulation result is shown in Table 3.

A comparison between the costs of existing business processes and proposed business processes is significant. The author uses the U.S.\$ currency in the iGrafx Process 2013 tools for measuring resources and costs. 1 US \$ is assumed as IDR 12.000.

Table 3. Existing Business Process VS Proposed Business using iGrafx

	Existing Business Process			Proposed Business Process		
	Average Length of Time (minute)	Resources Cost	Employee	Average Length of Time (minute)	Resources Cost	Employee
Customer Service Process	145.2	\$1,500.00	15	135	\$1,400.00	14
Procurement Process	220.2	\$ 600.00	6	175.2	\$ 600.00	6

#### 4. Conclusion

The clinical laboratory has some benefits such as facilitating search data, time reduction and cost reduction. Moreover the company can increase the number of estimated customers to 150 per day or more.

A process can be improved as retrieval results further simplify the process and achieve efficiency. The approval documents in the data exchange can be done electronically with the use of information technology as seen with the proposed business process in procurement. Using electronic data flow will affect the tasks and responsibilities related to units and require expertise in their field. It can achieve a time reduction (7.02% in customer service and 20.44% in procurement) and reduce the number of employees (6.67%). The cost of customer service for the proposed business processes is more reduced than the existing one. These factors show that reengineering in this case is completed. Business Process Reengineering (BPR) in this clinical laboratory improved its business competitiveness. This research can still be explored more intensely in terms of using iGrafx software to obtain significant results. The company can keep using the software iGrafx Process 2013 compared to doing trial and error.

The employees and management should be well prepared in order to operate their jobs to obtain the maximum results from the application of information technology such as using Enterprise Resource Planning (ERP). The application of information technology will be in vain if it is not supported by competent and skilled human resources in the field. The company must immediately give required training to its employees in this case.

#### References

- [1] 180Systems. Business Process Review-Failure Factors. Information Systems Management. Accessed 25/3/2014.
- [2] Daintith J. *A Dictionary of Physics*. 6<sup>th</sup> Ed. Oxford University Press. 2009.
- [3] Proctor KS. *Optimizing and Assessing Information Technology: Improving Business Project Execution*. ISBN 978-1-118-10263-3. John Wiley & Sons. 2011.
- [4] Strassman PA. *The Squandered Computer*. New Canaan. Conn. The Information Economics Press. 1997.
- [5] Yin G. BPR Application. *Modern Applied Science*. 2010; 4(4): 96–101.
- [6] Hussein B. *PRISM: Process Re-engineering Integrated Spiral Model*. VDM Verlag, Berlin. 2008.
- [7] Hammer M, Champy J. *Rekayasa Ulang Perusahaan: Sebuah Manifesto Bagi Revolusi Bisnis (translated by Marcus Prihminto Widodo)*. ISBN 9796051435. Jakarta: PT. Gramedia Pustaka Utama. 1995.
- [8] Lowenthal JN. *Reengineering the Organization: A Step-by-Step Approach to Corporate Revitalization*. ISBN 978-0873892582. Singapore: Toppan Company (S) Pte Ltd. 1996.
- [9] Al-Mashari MA, Zairi M. Revisiting BPR: A Holistic Review of Practice and Development. *Business Process Management Journal*. 2000; 6(1): 10-42.
- [10] Feng T. Study of Multi-source Fusion B2C Business Process Reengineering of the Petri net Model. *TELKOMNIKA Indonesian Journal of Electrical Engineering*. 2013; 11(11): 6762–6768.
- [11] Dooley K, Johnson D. Changing the new product development process: Reengineering or continuous quality improvement?. *Measuring Business Excellence*. 2001; 5(4): 32–38.
- [12] Davenport TH. *Process Innovation, Reengineering Work through Information Technology*. ISBN 0-87584-366-2. Harvard Business School Press Boston, MA, USA. 1993.
- [13] Tan VSL. *Change to Win*. ISBN 978-9812045126. 2<sup>nd</sup> Ed. Singapore: Times Books International. 1994.